To: technicalreports@afosr.af.mil
Subject: Final Statement to AFOSR Program Manager: Harold Schloosberg
Contract/Grant Title: Acquisition of Equipment for Research in Nanobiomedical Technologies
Contract/Grant #: FA9550-07-1-0065
Reporting Period: 01/01/07 to 12/31/07
From: Ilesanmi Adesida, PI; iadesida@uiuc.edu; University of Illinois Center for Nanoscale Science and Technology.

REPORT

May 29, 2008

AFOSR Grant for: Acquisition of Equipment for Research in Nanobiomedical Technologies

Ilesanmi Adesida, ECE/MNTL/CNST; PI;
co-PIs: Brian Cunningham, Irfan Ahmad, Taher Saif, and Rashid Bashir
Center for Nanoscale Science and Technology, University of Illinois,
Urbana, IL 61801
iadesida@uiuc.edu

ABSTRACT

The University of Illinois Center for Nanoscale Science and Technology (CNST) has been leading the way in facilitating research leading to the development of ultra-small, ultra-light, wirelessly-connected nano devices and materials for nanomedicine. Preliminary results from research conducted at the Micro and Nanotechnology Laboratory (MNTL) using some of the equipment purchased from AFOSR grant. The grant enabled University of Illinois to markedly transform the recently expanded MNTL from being primarily compound semiconductor and micro/nano electronics facility, to also being a state-of-the-art multidisciplinary bionanotechnology laboratory space. This has not only helped the laboratory in conducting cutting-edge research, but also has been used in training the next generation workforce in bionanotechnology addressing such issues as battlefield injuries, viruses, and cancer. It also has enabled the CNST and MNTL to leverage extra-mural funding. The florescent optical microscope (Olympus IX 81) was used to study cardiac cells cultured on substrates with varying stiffness. Equipment is being used for screening a small molecule compound library for drug molecules that have the capability for treating Parkinson's Disease.

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ORGANIZATION.

1. REPORT DATE *(DD-MM-YYYY)*	2. REPORT TYPE	3. DATES COVERED *(From - To)*
05-29-2008	Terminal Report	01-01-07 to 12-31-07

4. TITLE AND SUBTITLE
AFOSR Grant Report: Acquisition of Equipment for Research in Nanobiomedical Technologies

5a. CONTRACT NUMBER
FA9550-07-1-0065

5b. GRANT NUMBER
FA9550-07-1-0065

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)
Ilesanmi Adesida, ECE/MNTL/CNST; PI;
co-PIs: Brian Cunningham, Irfan Ahmad, Taher Saif, and Rashid Bashir
Center for Nanoscale Science and Technology, University of Illinois,
Urbana, IL 61801
iadesida@uiuc.edu

5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
University of Illinois
Center for Nanoscale Science and Technology, and Micro and Nanotechnology Laboratory
Suite 2104, 208, N.Wright Street, Urbana, IL 61801

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
Program Manager: Harold Schloosberg/NE
AF OFFICE OF SCIENTIFIC RESEARCH
875 NORTH RANDOLPH STREET ROOM 3112
ARLINGTON VA 22203

10. SPONSOR/MONITOR'S ACRONYM(S)
AFOSR

11. SPONSOR/MONITOR'S REPORT NUMBER(S)
AFRL-SR-AR-TR-08-0332

12. DISTRIBUTION/AVAILABILITY STATEMENT
DISTRIBUTION A: APPROVED FOR PUBLIC RELEASE

13. SUPPLEMENTARY NOTES

14. ABSTRACT

The University of Illinois Center for Nanoscale Science and Technology (CNST) has been leading the way in facilitating research leading to the development of ultra-small, ultra-light, wirelessly-connected nano devices and materials for nanomedicine. Preliminary results from research conducted at the Micro and Nanotechnology Laboratory (MNTL) using some of the equipment purchased from AFOSR grant. The grant enabled University of Illinois to markedly transform the recently expanded MNTL from being primarily compound semiconductor and micro/nano electronics facility, to also being a state-of-the-art multidisciplinary bionanotechnology laboratory space. This has not only helped the laboratory in conducting cutting-edge research, but also has been used in training the next generation workforce in bionanotechnology addressing such issues as battlefield injuries, viruses, and cancer. It also has enabled the CNST and MNTL to leverage extra-mural funding. The florescent optical microscope (Olympus IX 81) was used to study cardiac cells cultured on substrates with varying stiffness. Equipment is being used for screening a small molecule compound library for drug molecules that have the capability for treating Parkinson's Disease.

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE		14	Ilesanmi Adesida
					19b. TELEPHONE NUMBER *(Include area code)* 217-333-2150

Reset

INSTRUCTIONS FOR COMPLETING SF 298

1. REPORT DATE. Full publication date, including day, month, if available. Must cite at least the year and be Year 2000 compliant, e.g. 30-06-1998; xx-06-1998; xx-xx-1998.

2. REPORT TYPE. State the type of report, such as final, technical, interim, memorandum, master's thesis, progress, quarterly, research, special, group study, etc.

3. DATES COVERED. Indicate the time during which the work was performed and the report was written, e.g., Jun 1997 - Jun 1998; 1-10 Jun 1996; May - Nov 1998; Nov 1998.

4. TITLE. Enter title and subtitle with volume number and part number, if applicable. On classified documents, enter the title classification in parentheses.

5a. CONTRACT NUMBER. Enter all contract numbers as they appear in the report, e.g. F33615-86-C-5169.

5b. GRANT NUMBER. Enter all grant numbers as they appear in the report, e.g. AFOSR-82-1234.

5c. PROGRAM ELEMENT NUMBER. Enter all program element numbers as they appear in the report, e.g. 61101A.

5d. PROJECT NUMBER. Enter all project numbers as they appear in the report, e.g. 1F665702D1257; ILIR.

5e. TASK NUMBER. Enter all task numbers as they appear in the report, e.g. 05; RF0330201; T4112.

5f. WORK UNIT NUMBER. Enter all work unit numbers as they appear in the report, e.g. 001; AFAPL30480105.

6. AUTHOR(S). Enter name(s) of person(s) responsible for writing the report, performing the research, or credited with the content of the report. The form of entry is the last name, first name, middle initial, and additional qualifiers separated by commas, e.g. Smith, Richard, J, Jr.

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES). Self-explanatory.

8. PERFORMING ORGANIZATION REPORT NUMBER. Enter all unique alphanumeric report numbers assigned by the performing organization, e.g. BRL-1234; AFWL-TR-85-4017-Vol-21-PT-2.

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES). Enter the name and address of the organization(s) financially responsible for and monitoring the work.

10. SPONSOR/MONITOR'S ACRONYM(S). Enter, if available, e.g. BRL, ARDEC, NADC.

11. SPONSOR/MONITOR'S REPORT NUMBER(S). Enter report number as assigned by the sponsoring/ monitoring agency, if available, e.g. BRL-TR-829; -215.

12. DISTRIBUTION/AVAILABILITY STATEMENT. Use agency-mandated availability statements to indicate the public availability or distribution limitations of the report. If additional limitations/ restrictions or special markings are indicated, follow agency authorization procedures, e.g. RD/FRD, PROPIN, ITAR, etc. Include copyright information.

13. SUPPLEMENTARY NOTES. Enter information not included elsewhere such as: prepared in cooperation with; translation of; report supersedes; old edition number, etc.

14. ABSTRACT. A brief (approximately 200 words) factual summary of the most significant information.

15. SUBJECT TERMS. Key words or phrases identifying major concepts in the report.

16. SECURITY CLASSIFICATION. Enter security classification in accordance with security classification regulations, e.g. U, C, S, etc. If this form contains classified information, stamp classification level on the top and bottom of this page.

17. LIMITATION OF ABSTRACT. This block must be completed to assign a distribution limitation to the abstract. Enter UU (Unclassified Unlimited) or SAR (Same as Report). An entry in this block is necessary if the abstract is to be limited.

FINAL REPORT

May 29, 2008

AFOSR Grant for: Acquisition of Equipment for Research in Nanobiomedical Technologies

Ilesanmi Adesida, ECE/MNTL/CNST; PI;
co-PIs: Brian Cunningham, Irfan Ahmad, Taher Saif, and Rashid Bashir
Center for Nanoscale Science and Technology, University of Illinois,
Urbana, IL 61801
iadesida@uiuc.edu

INTRODUCTION

The University of Illinois Center for Nanoscale Science and Technology (CNST) working with several laboratories including the Micro and Nanotechnology Laboratory had envisaged the important role nanotechnology will play in the area of bone and tissue engineering. Some of the applications, which were conceived of included:

- Artificial skin for tissue reconstruction, burn, and wound healing
- Tissues and organ development using nanopatterned scaffolds
- Impregnation of substances for surface healing

The CNST is leading the way in facilitating research leading to the development of ultra-small, ultra-light, wirelessly-connected nano devices and materials for nanomedicine. This report discusses the research conducted at the Micro and Nanotechnology Laboratory (MNTL) using some of the equipment purchased from AFOSR grant. A list of equipment purchased from the AFOSR grant and equipment purchased from the College of Engineering, University of Illinois matching funds is provided in Appendix I.

1. Personnel Supported: List professional personnel (Faculty, Post-Docs, Graduate Students, etc.) supported by and/or associated with the research effort. : **N/A; None**

2. Publications: List peer-reviewed publications submitted and/or accepted during the l2-month period starting the previous 1 October (or since start for new awards).

i. "A General Method for Discovering Inhibitors of Protein-DNA Interactions Using SRU Photonic Crystal Biosensors," Leo L. Chan, Maria F. Pineda, James T. Heeres, Paul J. Hergenrother, and Brian T. Cunningham, *ACS Chemical Biology, in press, 2008*

ii. "A General Method for Discovering Inhibitors of Protein-DNA Interactions Using SRU BIND Optical Biosensor Microplates," Leo L. Chan, Maria F. Pineda, James T. Heeres, Paul J. Hergenrother, and Brian T. Cunningham, *Society of Biomolecular Screening, St. Louis, Missouri, April 2008*

3. Interactions/Transitions:

Leveraging the Grant

For Funding

The AFOSR equipment grant has enabled us to generate preliminary data and to highlight recent bionanomedical equipment to submit a series of proposals to various funding agencies. Similarly, research papers have been submitted to journals, and conference presentations have been made; projects leveraging the purchased equipment, and proposals submitted as of this report are provided in Appendices II-V..

For Training

Summer Course: July 30-Aug. 3, 2007 at the University of Illinois Micro and Nanotechnology Laboratory and other laboratories associated with the Center for Nanoscale Science and Technology (CNST), and the Center for Cellular Mechanics (CCM). www.ccm.uiuc.edu
PIs/Instructors: Taher Saif, Mechanical Science and Engineering(MechSE)/CCM; Brian Cunningham, Electrical and Computer Engineering
Course Coordinators: Taher Saif, MechSE; Irfan Ahmad, Associate Director, CNST; and Hanafy Fouly, Research Specialist, College of Agriculture; University of Illinois.

- The week-long hands-on summer course explored the relevant concepts and tools to understand the question of mechano sensitivity of cells.

- The objective of the course was to educate students, post docs, and faculty from engineering, biological and medical sciences about the basics of mechanics, thermodynamics, physiology, cell structure, and molecular biology in light of cell mechanosensitivity.

- The course had an hands-on component to train students on nano-fabrication, and basic cell culture.

Figure 1. University of Illinois Mechanosensitivity and Nanofabricated Devices Hands-on Summer Course 2007 trainees (left) exploring cell mechano-sensitivity, involving cell adhesion, growth pattern, motility, and cytoskeletal organization; and (right) photonic biocrystal sensor development, at the Micro and Nanotechnology Laboratory. Also covered nanofabrication involving lithography, silicon etching, film deposition and micro fluidics. The objective of the hands-on training was to familiarize researchers from the Washington University Medical School in Saint Louis and University of Illinois at Urbana-Champaign, along with 27 other institutions with nanofabrication techniques and mechanosensitivity, to enable nurturing of new ideas, and to foster multi-disciplinary research and education in the area of nanomedicine.

4. New discoveries, inventions, or patent disclosures. (If none, report None.) : **None**

5. Honors/Awards: List honors and awards received during the grant/contract period. List lifetime achievement honors such as Nobel Prize, honorary doctorates, and society fellowships prior to this effort.: **None**

Additional Information

Capacity Building and Research
The newly expanded $18 million Illinois state funded Micro and Nanotechnology Laboratory has a mission to create, support, and sustain an environment to facilitate advanced research in photonics, microelectronics, biotechnology and nanotechnology for the benefit of the university community, the state of Illinois, and the nation.

The AFOSR grant has markedly helped in transforming the recently expanded MNTL from being compound semiconductor and micro/nano electronics facility, to also being a state-of-the-art bionanotechnology laboratory space, as envisioned prior to the recent expansion. This has not only helped MNTL in under-taking cutting-edge research, some of which is highlighted in the next section, but also being used in training the next generation workforce, addressing such issues as battlefield injuries, viruses, and cancer, by working at the confluence of biotechnology and nanotechnology, Nanomedicine, and mechanobiology.

Research and Development
The liquid-handling equipment is being used for several projects. In particular the:

- Beckman Coulter Biomek NXP 384-well Automated Liquid Handling Station
- BioTek NanoQuot Liquid Dispenser
- BioTek ELx405 Microplate Washer

Another project (PI: Brian Cunningham, ECE/MNTL) funded by the National Institutes of Health (NIH)-funded project for screening a small molecule compound library for drug molecules that have the capability for treating Parkinson's Disease. Protein-DNA interaction is a very important process that maintains normal functions in the human body. A special protein-DNA interaction called Apoptosis,

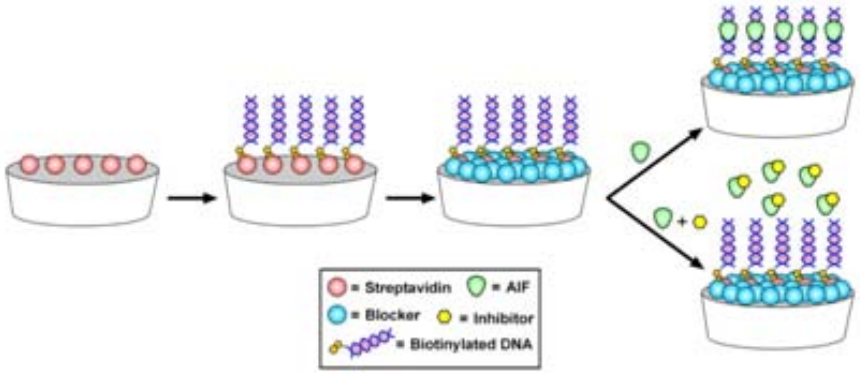

Figure 2. Protein-DNA binding experiments performed with PC biosensors. Streptavidin coated biosensors are used to bind biotinylated DNA oligomers. After overnight incubation, Starting Block™(Pierce Biotechnologies) is added to prevent nonspecific binding, and finally AIF is added.

where a protein called Apoptosis Inducing Factor (AIF) located in cell's mitochondria can translocate into nucleus, bind to the DNA, and causes DNA fragmentation. This process occurs normally in programmed cell death, but in neuro-degenerative diseases such as Parkinson's or Huntington disease, Apoptosis occurs often in the brain that causes unnecessary cell death. Thus, the objective is to find a certain drug that can inhibit the interaction between AIF and DNA to prevent unnecessary Apoptosis. In pharmaceutical companies, millions of small molecules (drugs) are screened to find cures for various diseases. However, the methods that companies employ are time consuming and expensive. In this work, we developed a screening protocol using photonic crystal biosensor potentially for pharmaceutical high throughput screening, which can rapidly examine 200,000 small molecules for possible inhibitors. Funded by the NIH, this work is the first time that high throughput screening is performed using label free detection system on 200,000 small molecules. The research is in collaboration with Dr. Paul Hergenrother and James Heeres in the departments of biochemistry and chemistry, University of Illinois.

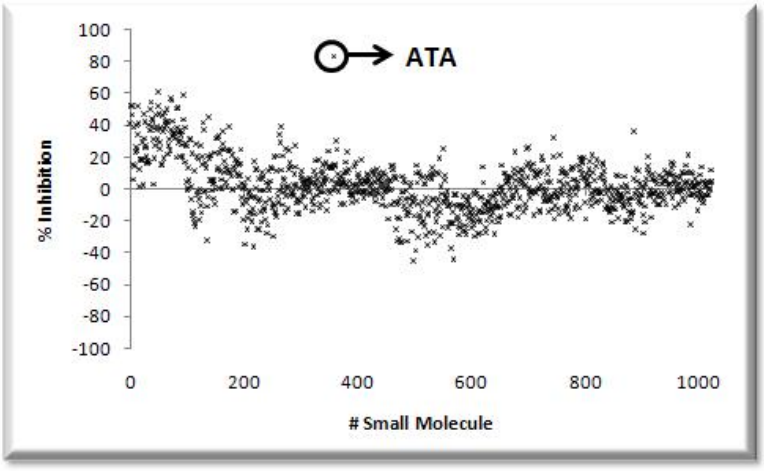

Figure 3. Inhibition data for all compounds screened, where ATA is the only compound out of the ~1000 screened to show significantly higher inhibition (~80%).

Funds were used to purchase components for an Enhanced Fluorescence Microscope. Using a photonic crystal structure with an optical resonance that matches the wavelength of a laser used to excite fluorescent molecules, we can excite adsorbed fluorescent-tagged biomolecules and cells to emit more light than they would on an ordinary surface. At the same time, a photonic crystal surface can also have a resonance at the wavelength of light given off by fluorescent molecules, so that emitted photons can be directed toward a microscope objective. The enhanced excitation and extraction phenomena can be used to detect fluorescent-tagged proteins and DNA with greater sensitivity than currently-used methods. However, commercially available instrumentation currently represents a significant bottleneck in maximizing the performance of photonic-crystal enhanced fluorescence. We are currently developing a fluorescence microscope-based enhanced fluorescence instrument that provides highly efficient light coupling to and extraction from a photonic crystal. CCD-based imaging enables large-area, high-resolution and high-throughput analysis. The prototype instrument also provides label-free imaging using a nearly identical beam path as that used for enhanced fluorescence. This allows complimentary images to be precisely overlaid in order to provide spatially registered images of enhanced fluorescence and surface-bound molecular density. Furthermore, additional imaging techniques available on the microscope, including brightfield and phase contrast, can also be overlaid. We anticipate these new capabilities will

significantly reduce current DNA and protein microarray detection limits and will open the door to new techniques for studying cellular adhesion, motility, and membrane-bound protein expression. Funding for this project is provided by the NSF and SRU Biosystems.

The general-purpose lab instruments, including

- Eppendorf 5415D Centrifuge
- Eppendorf 5415R Centrifuge
- Eppendorf 5810R Centrifuge
- Fisher Scientific Isotemp202 Heater Ultrasonic Bath (2)
- MilliQ Advantage A Water Purification System
- Labline 3D Rotator
- Vortex Mixers
- Thermo Electron Orion 3 Star pH Meter
- Metler Toledo XS205 Dual Range Digital Balance
- Denver Instrument APX-100 Digital Balance

Are being used in the following project:

- **Environmental detection of soybean rust spores (PIs/co-PIs: Brian Cunningham, ECE; Irfan Ahmad, CNST; College of Engineering; Glen Hartman, USDA, and Linda Kull, SDBC, College of Agriculture, Consumer, and Environmental Sciences (ACES). Funding: C-FAR, SDBC, and USDA.**

Asian soybean rust is a major soybean disease which can cause premature defoliation, early maturity, low seed weight, few pod and seed production. Early detection prior to visible symptoms may be critical for timing fungicide applications. In this project, we collaborate with Prof. Glen L. Hartman of the department of crop sciences at UIUC trying to detect soybean rust spores using label-free photonic crystal biosensors. The detection system enables imaging of the spores attached to the sensor surface without the use of fluorescent labels or stains. This study may represent the first use of photonic crystal biosensors for detection of rust spores and may be the first step in reaching the goal towards developing an economical and field deployable detection system. Funding for this project is provided by Soybean Disease Biotechnology Center (SDBC) and Illinois Council on Food and Agricultural Research (C-FAR).

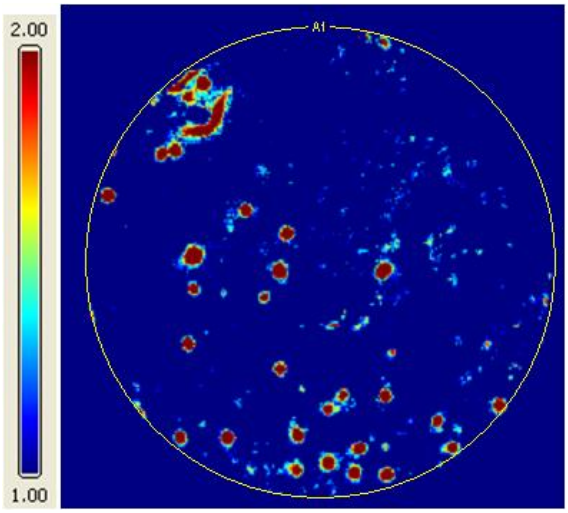

Figure 4. An image of spores/spores clusters on photonic crystal biosensor surface. Attachment of the spores to the sensor surface results in a highly localized increase of the resonant peak wavelength value (PWV) shown as red in color.

And also the following USAID project:
Nanomedicine for Cancer Research
Collaborators: Dr. Brian Cunningham; ECE; Dr. Kenneth L. Watkin, College of Applied Health Sciences and Beckman Institute; and Dr. Irfan Ahmad, Center for Nanoscale Science and Technology.
Plant Extracts provided by:
Professor R Chowdhury
University of Dhaka, Bangladesh
USAID Project with the University of Karachi HEJ Chemistry Institute (Prof. Attiya Abbasi).

Sources of Funding:
National Science Foundation Grant No. 0427657, SRU Biosystems, and USAID program.

A label-free method has been developed to observe the biological activity of human breast cancer cells using photonic crystal biosensors incorporated within 96-well microplates. This method is used to study cell attachment, proliferation, and detachment induced by the exposure of cells to potential drug compounds. The biosensors and associated imaging instrument enable quantitative measurements and visualization of cell populations attached to the sensor surface with single cell resolution. Cells are not stained with proprietary reagents that typically induce the death of the cells under study. Repeated measurement of the same cells can be made without removing them from their culture environment which allows for the direct determination of proliferation and apoptosis rates. Furthermore, the assay is simpler and more rapid than alternative cell proliferation assays and can be used for high throughput screening applications. Using this method, the effect of 61 different plant extracts on breast cancer cells has been studied, in which some extracts were shown to reduce cell proliferation while some others enhanced the rate of proliferation. The results are applicable to a wide range of cell types and compound libraries and an assay for human pancreatic cancer cells is currently under development.

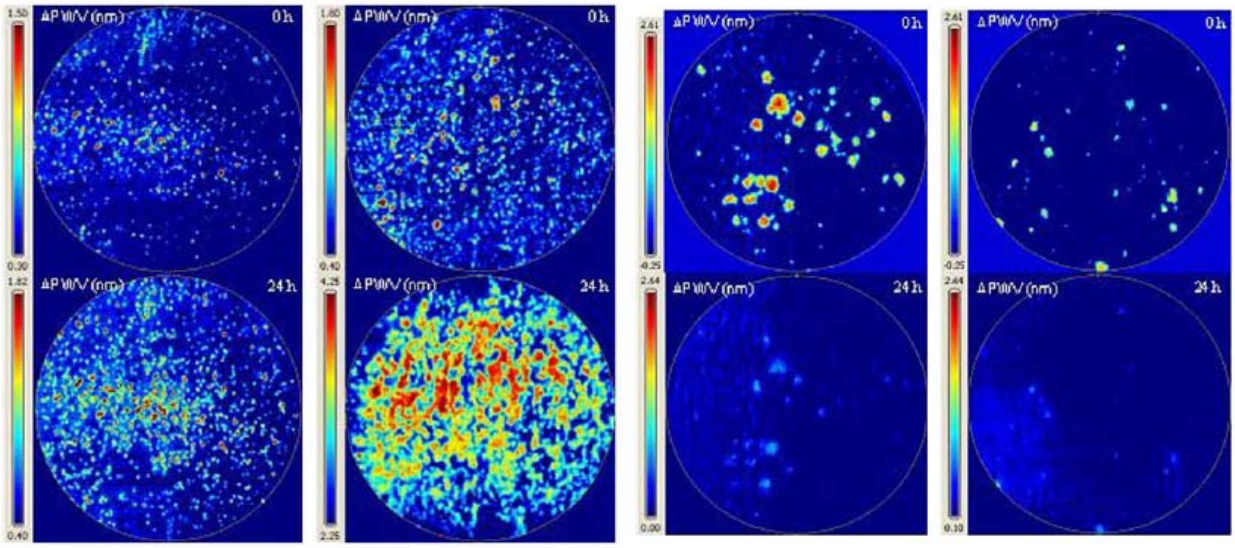

Figure 5: Peak Wavelength Shifts of a 6mm diameter well after breast cancer cell attachment (upper) and 24 hours after attachment (down) without chemical exposure (a) with exposure to a plant extract *Sapindus Mukurossi*, which enhanced cell proliferation (b) with exposure to a known drug *Doxorubicin*, which reduced cell proliferation (c) with exposure to a plant extract *Curcumin*, which reduced cell proliferation

Study of Cardiac Cells

The florescent optical microscope (Olympus IX 81) is being used to study cardiac cells cultured on substrates with varying stiffness. In the near future, the same microscope will be used to study adhesion between cancer cells (funded by National Science Foundation (NSF)). (PI: Taher Saif, MechSE/CCM/MNTL).

Conclusion. The AFOSR equipment grant helped the University of Illinois Micro and Nanotechnology Laboratory to rapidly develop bionanomedical capabilities for conducting research and training pertaining to battlefield injuries, viruses, cancer, cardio-, and neural disorders.

APPENDIX I: List of equipment purchased from the AFOSR grant, and College of Engineering, University of Illinois matching funds.

AFOSR Equipment Purchased

FA9550-07-10-0065 and Matching

Item Description	Purchase Order #	Amount	Inventory #	Room #
Titramax 100 shaker	PCA0EU0M	1229.67	F26611	3119
under $500 items 12/07	P0135066	250.92	-	3119
Mini horizontal system	P0135066	248.6	-	3119
Q-gard, T2	P0135066	331.24	-	3119
Quantum tex	P0135066	288.59	-	3119
Millipak express	P0135066	130.2	-	3119
Mobile Stand, NAPCO	P0135066	385.59	-	3119
Napco C02 gas reg (2*279.22)	P0135066	558.44	-	3119
Eppendorf centrifuge	P0135066	1869.15	F26612	3119
Eppendorf centrifuge	P0135066	4398.75	F26613	3119
Analytical balance	P0135066	3923.75	F26614	3119
Digital water bath	P0135066	579.56	F26615	3119
Lab rotator, Barnstead	P0135066	639.4	F26616	3119
Horizontal gel box	P0135066	610.5	F26617	3119
Recirc midi-horz sytem electrophoresis	P0135066	573.5	F26618	3119
Recirc horz sytem electrophoresis	P0135066	809.38	F26619	3119
Sonic cleaner tmr htr 4 qt	P0135066	508.23	F26637	3119
Microscope, inverted, digital	P0135066	4611	F26625	3119
Millipore Q-pod to go w/water purificaiton system	P0135066	1274.14	F26622	3119
Water bath digial	P0135066	652.35	F26623	3119
Thermo Forma Cryo Tank 100 liters for LN	P0135066	3428.98	F26630	3119
Nanoquote microplate dispenser (Fisher Sci)	P0135091	13885.5	F26624	3119
Spectrophotometers, Atomic Absorption, Nanodrop Tech	P0135080	10370	F26627	3119
Microplate washer w/ultrasonic advantage (Fisher Sci) (Nanoquote)	P0135091	15008.13	F26628	3119
Napco, CO2, incubator	P0135066	6037.2	F26632	3119C2
Napco, CO2, incubator	P0135066	6037.2	F26631	3119C3
Milli-Q Advantage A10 water purifier	P0135066	6685.2	F26629	3119
Lab refrigerator, 45.8 cu. Ft.	P0135066	5978.28	F26635	3119
Freezer value si ult below 86C (Thermo Fisher)	P0135066	10301.83	F26636	3119A
FY07 Total		**101605.28**		
Installation costs for Milli-Q ($448and 298)	P0135066	746	-	3119
Mobile Stand, NAPCO	P0140826	385.59	-	3119
Plate Reader, fluor/multi detec rdr w/inje (Biotek)	P0135066	33529.69	F26633	3119
Multichannel well plate liquid dispenser (Beckman Coulter)	P0139653	119586.35	F26641	3119A
Flow cytometer (Guava Technologies)	P0139601	109934.09	F26640	3119C2
		-2500		
ALD-reactor and 2 hot precursor liens, Cambridge Nanotech	P0146196	129995	F26662	232

Electron Microscopy Equipment, Olympus	P0150118	57135.85	F26660	3119C5
Fixed stage reflected light microscope, Olympus	P0150118	36471.9	F26663	3119C5
		-1899.05		
Electron Microscopy Equip, motorized research microscope, Olympus	P0150118	134661.18	F26664	3119C5
Atomic Force Microscope, Asylum Research	P0148224	233050	F26666	3119C1
Portion of P0146196 to matching	J0923381	-6181.88		
Probe System, Janis Research	P0143179	106960	F58902	1321
Paid by ECE ICR		-53480		
Total FY08		**898394.72**		
TOTAL AFOSR Equipment		**1000000**		
UIUC MNTL Matching Account: 1-200250-487004-487018				
Supplies/Biolab				
Sciencelab.com	PCA0E0PL	421.13		
Labconco.com	PCA0FAH4	670.26		
Campbell Hausefe	PCA0HTWV	39.91		
Edmund Optics	PCA0KVFX	1065.75		
Newport Corp. and shipping	PCA0KVFY	293.19		
National Instruments	PCA0KZ7Z	1063.26		
UPS and Fedex charges	PCA0K2BE/K4UY	27.63		
Newport Corp.	PCA0L0X5	48.23		
Edmond Optics	PCA0L1UB	445		
Thorlabs, Inc. (equipment under $500)	PCA0LUZ0/910	2233.67		
Zaber Technologies	PCA0L4D8	56		
Valuetax	PCA0M563	172.68		
Maxstores	PCA0LVH7	279		
Thorlabs	PCA0M8G7/8	1291.76		
Credit, Newport	PCA0MH0W/X	-209.21		
Thorlabs, Inc. (equipment under $500)	PCA0M8G7/8	780		
Roadway, shipping P0148224	PCA0NJ54	737.96		
VWR	PCA0NRKV	912.3		
Shipping of Thorlabs, F26675 below	PCA0NPHB	146		
VWR	J0923406	334.74		
Dynalab (LN containers)	J0923396	2268.25		
Total supplies		**13077.51**		
Equipment				
Actuator from Newport	PCA0KVFY	1399	F26657	3119
Mirror mount from Newport	PCA0KVFY	1053	F26656	3119
FB3000 Electrophoresis Power supply	P0149815	1855.3	F26646	3119
FB3000 Electrophoresis Power supply	P0149815	1855.3	F26647	3119
Titramax 100 shaker	P0149815	1020	F26645	3119C1
Motorized linear stage	PCA0KVFZ	1060	F26655	3119
SCM100C Driver/controller	PCA0L0X5	770	F26658	3119
Computer from Central Stores	GSS03774	2150.4	G77957	3119
CCD Camera 512xz512 BT frame grabber	P0156285	35150	F26672	3119C5
Lumenera digital camera	P0156285	1330	F26671	3119C5
Olympus Model BX51W1 microscope	P0156285	29291.91	F26673	3119C5

PSA506 Sciencedesk active isolation table	PCA0NPHB	4625.7	F26675	3119C5
Portion of P0146196 to matching	J0923381	6181.88		
Total Equipment		**87742.49**		
Total Matching FY07 and FY08		**100820**		

Additional NanoBiolab Equipment
(Not part of AFOSR/UIUC Matching)

Aspirator System	695	F26676	3119B1
DC Power supply, HP	1315	F58900	3119B1
Refrigerated Bath	2539	F58901	3119B1
Kinetic Systems Vibration Isolation Table	2400	F58904	3119B1

APPENDIX II: PARTIAL LIST OF PROJECTS LEVERAGING THE PURCHASED EQUIPMENT

- **Integrated Biochip Sensors for Detection of Cancer.** Funding: National Institutes of Health; Overall: $3.22M; 2007-12. *(will leverage)*
  PI: Rashid Bashir

- **Nanomedicine for Cancer Research.** Funding: USAID; Overall: ~$0.5M; 2007-10.
  PI: Kenneth Watkin, Irfan Ahmad, Brian Cunningham, University of Illinois; Attiya Abbasi, University of Karachi HEJ Chemistry Institute.

- **Nanomaterials and Nanofabrication for Cancer Therapeutics. Siteman Center of Cancer Nanotechnology Excellence (SCCNE)** with Washington University Medical School, Saint Louis, MO. Funding: National Cancer Institute; Overall: ~$16M; 2005-10.
  UIUC PI: Rashid Bashir, co-PIs: Ilesanmi Adesida, Irfan Ahmad, and Jonathan Sweedler.

APPENDIX III: LIST OF PROPOSALS SUBMITTED LEVERAGING THE PURCHASED EQUIPMENT

1. **Micro and Nano-mediated 3D Cardiac Tissue Engineering, 2008. US Army, TATRC.**
   PI: Rashid Bashir, co-PIs: Brian Cunningham, Taher Saif, Larry Schook, and Hyun Kong University of Illinois.

2. **Center for Medical and Pharmaceutical Nanotechnology. 2008**. Letter of Intent being submitted to NSF: Industry/University Cooperative Research Center.
   PI: Brian Cunningham, co-PIs: Rashid Bashir, Jimmy Hsia, and Irfan Ahmad, University of Illinois.

3. **Cellular and Molecular Mechanics and BioNanotechnology (CMMB). 2008**. Pre-proposal submitted to NSF: Integrative Graduate Education and Research Program.
   PI: Rashid Bashir, co-PIs: Martha Gillette, Jimmy Hsia, Taher Saif, and Irfan Ahmad, University of Illinois; and Michael Sheetz, Columbia University.

4. **Three-Dimensional Tissue Engineering using Stereolithography: From Computer-Aided Design to Biological Organs. 2008**. Proposal submitted to Draper Labs., MA:
   PI: Rashid Bashir, co-PI: Irfan Ahmad, University of Illinois.

5. **Rapid Label-Free Biosensor Evaluation of Medicinal Plant Extract Cytotoxicity and Proliferation Profiles in Breast Cancer Cells. 2007. Proposal submitted to Susan Komen Breast Cancer Foundation.**
   PI: Kenneth L. Watkin, co-PIs: Brian T. Cunningham, and Irfan S. Ahmad, University of Illinois.

APPENDIX IV: LIST OF TRAINING COURSES HELD LEVERAGING THE PURCHASED EQUIPMENT

- MechanoSensitivity and Nanofabricated Devices: Hands-on Summer Course 2007 (national/international: 70 attendees: see table 1 for participating institutions), Urbana, Illinois. Sponsored by: UI Center for Cellular Mechanics; Center for Nanoscale Science and Technology; Siteman Center of Cancer Nanotechnology Excellence; and the National Science Foundation.
-

Table 1. List of mechanosensitivity summer course 2007 participating institutions.

1. Boston University	16. The Pennsylvania State University
2. California Polytechnic State University	17. University of Arkansas
3. Carnegie Mellon University	18. University of California, Irvine
4. City University of Hong Kong	19. University of Illinois
5. COMSATS Institute of Information Technology, Pakistan	20. University of Maryland, College Park
6. Cornell University	21. University of Michigan
7. Harvard-MIT	22. University of Pennsylvania
8. Iowa State University	23. University of Texas
9. Lehigh University	24. University of Toledo
10. Massachusetts Institute of Technology	25. University of Washington
11. North Dakota State University	26. University of Wisconsin
12. Penn State University	27. Virginia Commonwealth University
13. Purdue University	28. Washington University in St. Louis
14. Stanford University	29. National Science Foundation
15. Texas A&M University	

APPENDIX V: LIST OF CONFERENCE RESEARCH PRESENTATIONS; LEVERAGING PURCHASED EQUIPMENT

- Abbasi. A., S. Naz, U. Zaman, I.S. Ahmad, K. Watkin, and B.T. Cunningham. 2008. Preliminary studies on biologically active proteins/peptides from medicinal plants. Annual International Meeting of the American Society of Agricultural and Biological Engineers (ASABE). June 29-July 2, 2008, Providence, RI.
- Ahmad, I.S., K. Watkin, and B.T. Cunningham. 2007. Nanomedicine for Developing Cancer Therapies. Invited Presentation at the Biological Sensorics Conference of the American Society of Agricultural and Biological Engineers (ASABE). June 2007, Minneapolis, MN.

***